Maintaining your Regenerative Turbine Pump

While well-selected regenerative turbine pumps offer exceptionally long service life in chiller applications, like all pumps, there are many circumstances that can significantly impact service life. The following items should be carefully considered when installing and using regenerative turbine pumps to ensure a long, trouble-free operating life.

- Regenerative turbine pumps are capable of very high pressures, so they have very tight running clearances (typically .002” ~ .006”) to help prevent the internal loss of this pressure. As a result, please be aware that regenerative turbine pumps are very intolerant of grit and abrasive material in the fluid stream. Fluid contamination tends to erode the impeller vanes, lodge between the impeller and the casing, and cause premature failure in mechanical seals. System startup is especially critical because even if the fluid is clean and grit free, new piping systems often have solder spatter, pipe dope, and metal chips in them, while older systems may occasionally release clumps of pipe scale and rust into the pump both causing minor damage that can accumulate over time to reduce performance. In either case, it is important to flush and inspect the system before startup. Installation of a suction strainer is very useful in protecting the pump if the strainer is cleaned regularly. This issue alone is probably the most common mode of failure for regenerative turbine pumps, so proper consideration should be given to protecting the pump from this type of damage.

- Protect the pump from “dead-head” conditions where the discharge is completely shut off while in operation. While some turbines are tolerant of short periods of zero flow, mechanical seal damage, pump and/or motor overheating, and even system damage due to excessive overpressure may occur as a result of running a pump in this state. Always make sure all system valves are open and the piping is restriction-free before pump startup. If you anticipate this condition, use of a properly sized relief valve and/or overpressure cutout system to protect the pump and the system.

- The use of modulating valves or other conditions that would cause sudden pressure shocks on the system are detrimental to regenerative turbine life. The self-adjusting balanced impeller feature relies on the pump attaining pressure equilibrium within a reasonable period of time. Sudden pressure shocks alter that balance and may cause the impeller to rub against the casing until equilibrium is regained. Continuous repeated pressure shocks from modulating valves or other system components can keep the impeller in a constant state of flux and cause excessive impeller rubbing and eventual failure.
• All pumps should be protected from dry running. Please assure that all system valves are open, and the pump suction is flooded before startup. Momentary jogging of pumps to confirm proper rotation is permissible.

• Provide proper NPSH (net positive suction head) availability to the pump. Although some regenerative turbine pumps are fairly tolerant of poor NPSH conditions (poor NPSH causes cavitation and liquid flashes to the vapor state), running the unit for extended periods of time will shorten service life. The problem with vapor in the fluid is that vapor does not provide the lubrication and cooling necessary for mechanical seals, sealless pump bearings, and the impeller hydrodynamic film. This condition is functionally identical to dry running, but to a lesser degree. Also be aware that any restrictions in the suction flow, including poorly selected suction strainers, insufficient suction pipe size, and partially closed suction valves can also cause cavitation, vapor flashes, and a partial dry running condition that can cause reductions in performance and premature failure.

• Key to avoiding many of the issues above is a good preventive maintenance program. All pumps will eventually fail if maintenance is ignored completely. Mechanical seals, sealless pump bearings, and impellers should be examined for unusual or excessive wear, fluid chemistry should be monitored and maintained, suction strainers should be cleaned regularly, relief valves should be tested, and many other items relating to the system itself should be checked on a regular basis to help prevent problems that could affect pump service life. For common applications, it is recommended that a basic spare parts kit be kept on hand and readily available at all times. For more critical services, a duplicate pump is often the most expedient and cost effective way to prevent or minimize downtime.

Regenerative turbine pumps have been used successfully for over 35 years in many different applications such as chillers, heat exchangers, boiler feed, spraying, reverse osmosis, fire protection, refrigeration, chemical process, and recirculation. Long service life in a pump relates as much to the pump and system design as it does to the quality and execution of the preventive maintenance plan. As with any piece of equipment, there is no substitute for using the right tool for the job.